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COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS

Sub-Committee of Experts on the
Transport of Dangerous Goods
(Fifteenth session,
Geneva, 29 June-10 July 1998,
agenda item 5(a))

MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Listing and classification
Copper sulphate, solid or solution

Transmitted by the Expert from Germany

1. Large volumes of copper sulphate and copper sulphate pentahydrate are shipped. Copper solutions are of industrial importance not only used as a basis for fungicidal or algicidal preparations.

2. Copper sulphate and copper sulphate solutions have been regulated under UN 3010 COPPER BASED PESTICIDES according to Class 6.1 criteria based on the entry "copper compounds" in the list of Common Pesticides. Based on former RID/ADR regulations for Class 6.1 item number 87(c) solutions with 20 to 100, solid mixtures with 50 to 100 percent copper sulphate had been regulated under Packing group III of Class 6.1. The comprehensive deletion of the Pesticides Table decided by this Sub-Committee in 1995 removed any citation of copper compounds from the UN Recommendations on the Transport of Dangerous Goods.

3. Deletion of entries in dangerous goods regulations, toxicological extrapolations based on human experience and data on strong toxicity to aqueous organisms are confusing industry and authorities leading to many inquiries concerning classification.

Properties

4. Oral LD50 values of copper sulphate between 300 and 960 mg/kg are common for the rat, but e.g. as low as 87 mg/kg in a mouse experiment. The reason for large species differences is not known mainly because the biochemical mechanism of excessive doses of copper is not well understood.

5. Several cases of accidental or suicidal ingestion, with a total of less than 500 mg copper, equivalent to less than 30 mg/kg, have been fatal for children. The fatal dose for adults is difficult to estimate because of vomiting, but it is about 140 mg/kg. The corrosive effect of large doses of copper sulphate to mucous membranes in the gastrointestinal tract leads to shock. Patients often die in shock 2 or 3 hours after ingestion, if they survive. The absorption of copper produces severe hemolysis, icterus or liver granulomas or/and renal failure. Therefore, classification of copper sulphate solutions has to be based on human experience, too.

6. Besides toxic effects to men, copper solutions show strong toxic effects on water organisms and the potential for accumulation of copper mainly in shellfish would lead to a classification of copper sulphate according to the criteria of RID/ADR and IMDG Code for environmentally hazardous substances.

7. Solutions of copper sulphate are not corrosive to iron and galvanized iron according to criteria of Class 8.

8. A Data Sheet for substances submitted to the United Nations for new or amended classification based on COPPER SULPHATE, SOLID OR SOLUTION is attached.

Proposal

9. Based on measurements, scientific extrapolations and practicability, the following amendment to the Recommendations is proposed:

Add to Chapter 2:

"UN 3XXX COPPER SULPHATE, SOLID or SOLUTION 6.1 ABC III"

Add special provision:

"ABC Based on human experience solid mixtures or preparation containing less than 50 percent copper sulphate and solutions of less than 25 percent copper sulphate are not subject to these Recommendations"

Add to index:

"Copper sulphate pentahydrate, see	6.1	UN 3XXX
Copper sulphate pentahydrate solution, see	6.1	UN 3XXX"

DATA SHEET TO BE SUBMITTED TO THE UNITED NATIONS FOR NEW OR AMENDED CLASSIFICATION OF SUBSTANCES

Submitted by . **Germany**. . . . . Date **March 1998** . . . . . .

Supply all relevant information including sources of basic classification data. Data should relate to the product in the form to be transported. State test methods. Answer all questions - if necessary state "not known" or "not applicable" - If data is not available in the form requested, provide what is available with details. Delete inappropriate words.

Section 1. SUBSTANCE IDENTITY

1.1 Chemical name **COPPER SULPHATE, SOLID OR SOLUTION** . . . . . .

1.2 Chemical formula **$CuSO_4/CuSO_4 \cdot 5\ H_20$** . . . . . .

1.3 Other names/synonyms **BLUE VITRIOL, CUPRIC SULFATE** . . . . . .

1.4.1 UN number **3XXX** . . . . . 1.4.2 CAS number **7758-99-8 , 7758-98-7** . . . . . .

1.5 Proposed classification for the Recommendations

1.5.1 proper shipping name (3.1.2 */)

1.5.2 class/division **6.1** . . . . . subsidiary risk(s) . . . . . .
packing group **III** . . . . . .

1.5.3 proposed special provisions, if any **see proposal** . . . . . .

1.5.4 proposed packing method . . . . . .

Section 2. PHYSICAL PROPERTIES (Data for solid pure substance)

2.1 Melting point or range . . . . . °C

2.2 Boiling point or range . . . . . °C

2.3 Relative density at :

2.3.1 15 °C **2.3** . . . . . .

2.3.2 20 °C **3.6** . . . . . .

2.3.3 50 °C . . . . . .

2.4 Vapour pressure at : **(no vapour)**

2.4.1 50 °C . . . . . **kPa**

2.4.2 65 °C . . . . . **kPa**

2.5 Viscosity at 20°C**/ **(water)** . . . . . m^2/s

2.6 Solubility in water at 20°C **15 °C** **20.9** . g/100 ml
0 °C **14.3** g/100 ml

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

2.7 Physical state at 20°C (2.2.1.2*/) **solid/liquid/~~gas~~****/

2.8 Appearance at normal carriage temperatures, including colour and odour .....
odorless, metallic taste, colourless (solid) .....

2.9 Other relevant physical properties **200 -650 °C solid decomp to cupric oxide** .....
.....

Section 3. FLAMMABILITY

3.1 Flammable vapour **not relevant**

3.1.1 Flash point (2.3.3*/) ..... °C oc/cc

3.1.2 Is combustion sustained? (2.3.1.2*/) . yes/no

3.2 Autoignition temperature ..... °C

3.3 Flammability range (LEL/UEL) ..... %

3.4 Is the substance a flammable solid? (2.4.2 */)

3.4.1 If yes, give details .....
.....
.....

Section 4. CHEMICAL PROPERTIES

4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity ? **~~yes~~/no**
If yes, state

4.1.1 Inhibitor/stabilizer used .....

4.1.2 Alternative method .....

4.1.3 Time effective at 55°C .....

4.1.4 Conditions rendering in ineffective .....

4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.1 */) **~~yes~~/no**

4.2.1 If yes, give details .....
.....
.....

4.3 Is the substance a desensitized explosive? (2.4.2.4 */) **~~yes~~/no**

4.3.1 If yes, give details .....
.....
.....

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*/ *This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.*

**/ *See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.*

4.4 Is the substance a self-reactive substance? (2.4.1 */) **yes/no**

If yes, state

4.4.1 exit box of flow chart .....

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? ..... °C

Is the temperature control required? (2.4.2.3.5 */) yes/no

4.4.2 proposed control temperature for a 50 kg package ..... °C

4.4.3 proposed emergency temperature for a 50 kg package ..... °C

4.5 Is the substance pyrophoric? (2.4.3 */) **yes/no**

4.5.1 If yes, give details .....
.....
.....

4.6 Is the substance liable to self-heating? (2.4.3 */) **yes/no**

4.6.1 If yes, give details .....
.....
.....

4.7 Is the substance an organic peroxide (2.5.1 */) **yes/no**

If yes state

4.7.1 exit box of flow chart .....

What is the self accelerating decomposition temperature (SADT) for a 50 kg package? ..... °C

Is the temperature control required? (2.5.3.5.1 */) yes/no

4.7.2 proposed control temperature for a 50 kg package ..... °C

4.7.3 proposed emergency temperature for a 50 kg package ..... °C

4.8 Does the substance in contact with water emit flammable gases? (2.4.4 */) **yes/no**

4.8.1 If yes give details .....
.....
.....

4.9 Does the substance have oxidizing properties (2.5.1 */) **yes/no**

4.9.1 If yes, give details .....
.....
.....

4.10 Corrosivity (2.8 */) to:

4.10.1 mild steel **pitting corrosion reported** ..... mm/year at ..... °C

4.10.2 aluminium **0.2** .. mm/year at **20 °C**

4.10.3 other packaging materials
(specify) .... mm/year at .....
.... mm/year at .....

4.11 Other relevant chemical properties .....

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Section 5. HARMFUL BIOLOGICAL EFFECTS (Data based on copper dosage)

5.1 LD 50, oral (2.6.2.1.1 */) **87-960** ..... mg/kg Animal species **mouse/rat** .....

5.2 LD 50, dermal (2.6.2.1.2 */) / ..... mg/kg Animal species / .....

5.3 LC 50, inhalation (2.6.2.1.3 */) / ..... mg/litre Exposure time / ..... hours
or ..... ml/m³ Animal species .....

5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3 */) / ..... ml/m³

5.5 Skin exposure (2.8 */) results Exposure time ..... hours/minutes
Animal species .....

5.6 Other data **not corrosive - irritating for skin and eyes** .....
.....

5.7 Human experience **lowest lethal toxicity 5-50 mg/kg range** .....
.....

Section 6. SUPPLEMENTARY INFORMATION

6.1 Recommended emergency action

6.1.1 Fire (include suitable and unsuitable extinguishing agents)
See IMO EMS No 6.1 - 0.2: foam, water, carbon dioxide .....

6.1.2 Spillage **hazardous to the aquatic envionment, prevent spreading of substance; absorb in sand** .....

6.2 Is it proposed to transport the substance in :

6.2.1 Intermediate Bulk Containers (6.5*/) ? **yes/no**

6.2.2 Portable tanks (6.6*/) ? **yes/no**

If yes, give details in Sections 7 and/or 8.

Section 7. INTERMEDIATE BULK CONTAINERS (IBCs) (only complete if yes in 2.6.2.1.1)

7.1 Proposed type(s) .....

Section 8. MULTIMODAL TANK TRANSPORT (only complete if yes in 2.6.2.1.2)

8.1 Description of proposed tank (including IMO tank type if known) .....
.....

8.2 Minimum test pressure .....

8.3 Minimum shell thickness .....

8.4 Details of bottom openings, if any .....

8.5 Pressure relief arrangements .....

8.6 Degree of filling .....

8.7 Unsuitable construction materials .....

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